# Osmium isotope anomalies at the end of the Paleoproterozoic Huronian glaciation: the rise of atmospheric oxygen and snowball earth

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The early Paleoproterozoic era (2.5 to 2.0 Ga) is characterized by repeated glaciations and the rise of atmospheric oxygen. Recent geochemical studies of sulfur isotopes suggested that the initial accumulation of atmospheric oxygen had occurred during the interglacial epoch at 2.32 Ga [1]. However, the detailed relationship between the glaciations and the rise of atmospheric oxygen has been poorly understood. Here, we found large osmium (Os) anomalies with high initial 187Os/188Os ratios (up to 1.0) in thin (1.5 m thick) sandstone interval which represents a transitional zone from diamictites of Bruce Formation to the cap carbonates of Espanola Formation of the Huronian Supergroup, suggesting that chemical weathering of Os under an oxidized condition has started immediately after the glaciation. Rhenium/Osmium geochronology also demonstrates that the anomalies are a primary sedimentary feature dated to around 2.3 Ga. In the diamictites, on the other hand, the initial 187Os/188Os ratios are very low and close to those of mantle-derived components at the time of sedimentation. Such a variation of the initial 187Os/188Os ratio at the end of the glaciation can be explained by (1) a redox transition from low to high oxygen levels in the atmosphere due to post-glacial photosynthetic blooming and/or (2) an extreme climatic transition from icehouse to greenhouse conditions in the aftermath of a Snowball glaciation.

[1] A. Bekker et al. Nature, 427, 117 (2004)